भारतीय मानक

Indian Standard

IS 17814 : 2022

नालीदार धातु नम्य सुरक्षा गैस होज असेंबली — विशिष्टि

Corrugated Metal Flexible Safety Gas Hose Assemblies — Specification

ICS 23.040.70

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March 2022 **Price Group 7**

Domestic and Commercial Gas Burning Appliances Sectional Committee MED 23

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards on the recommendation of the Domestic and Commerical Gas Burning Appliances (Pressure Type) Sectional Committee, and approved by the Mechanical Engineering Division Council.

The standard covers the requirements of hose assemblies suitable for the connection of gas appliances used in commercial kitchens, residential kitchens and domestic appliances inside or outside a dwelling with a maximum operating pressure of 1.0 Mpa.

The relevant SI units and corresponding conversion factors are given below for guidance:

Pressure 1Pa (Pascal) = 1 N/m^2
1 kgf/mm^2 = 9.806 65 MPa

The composition of the Committee responsible for the formulation of this standard is given in Annex Q.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CORRUGATED METAL FLEXIBLE SAFETY GAS HOSE ASSEMBLIES — SPECIFICATION

1 SCOPE

The standard covers the requirements of hose assemblies suitable for the connection of gas appliances used in commercial kitchens, residential kitchens and domestic appliances inside or outside a dwelling with a maximum operating pressure of 1.0 Mpa.

2 REFERENCES

The standard listed below contain provision which, through reference in this text, constitute provision of this standard. At the time of publication, edition was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate possibility of applying the most recent edition of the standard indicated below:

IS No	*Title*
319 : 2007	Free cutting brass bars, rods and section — Specification (*fifth revision*)
554 : 1999	Pipe threads where pressure-tight joints are made on the threads — Dimensions, tolerances and designation (*fourth revision*)
2305 : 1988	Method for mercurous nitrate test for copper and copper alloys (*first revision*)
5116 : 2020	Domestic and commercial equipment for use with LPG — General requirements (*fourth revision*)
6528 : 1995	Stainless steel wire — Specification (*first revision*)
6911 : 2017	Stainless steel plate, sheet and strip — Specification (*second revision*)
11149 : 1984	Specification for rubber gaskets

3 TERMINOLOGY

For the purposes of this standard, the following terms and definitions shall apply.

3.1 Domestic Appliance — Appliance intended for use by individual householders inside or outside a dwelling.

3.2 Corrugated Metal Hose — Pressure-tight hose made from tube or from welded strip with corrugations, helicoidal or annular to the axis of the hose, made by deforming the metal.

3.3 End Fittings — Components attached to a metal hose (*see* Fig. 1) so as to constitute a metal hose assembly.

3.4 Screwed Connection — Leak-tight threaded connection, which can only be assembled and disassembled with an appropriate tool.

3.5 Integrated Non-detachable Fitting — End fitting, permanently attached to the corrugated metal hose by such a method as welding, so as to ensure that it cannot be detached without destruction or alteration.

3.6 Armouring/External Wire Braid — External reinforcement, wholly covering the corrugated metal hose, which is designed to improve the mechanical characteristics of the hose.

3.7 External Protection/Insulation — Outer cover used to protect the hose from environmental and other outside influences.

3.8 Seal/Gasket — Non-metallic element assuring leak-tightness between two adjacent elements, be they fixed or movable in respect to each other.

3.9 Fuel Gas for Domestic/Commercial Kitchen Gas Appliances — Gases, such as liquefied petroleum gas (LPG) and natural gas (NG) used for domestic/commercial cooking purpose.

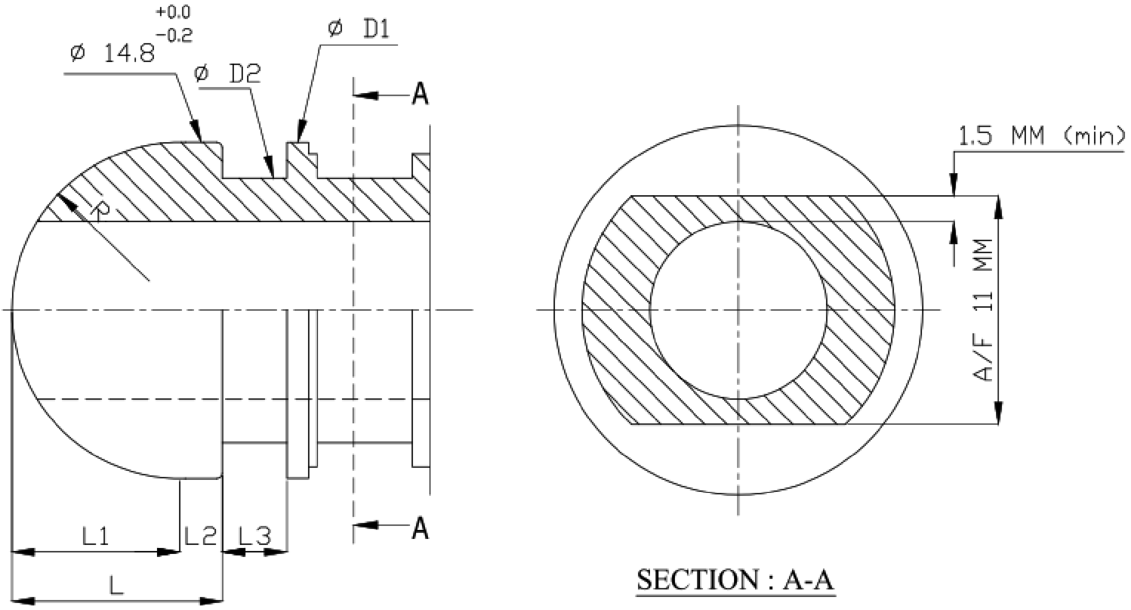
3.10 Burst Pressure — The CMFSG Hose Assembly withstand a minimum bursting pressure of four times the maximum working pressure. Test method described in Annex A.

4 REQUIREMENTS

4.1 General

These corrugated metal flexible safety gas (CMFSG) hose assemblies are to be fitted between the gas supply valve/regulator or the socket of a quick disconnect device and the appliance inlet connection, consisting of a corrugated metal hose with reinforced braid and its end fittings with appropriate gaskets and, if required, an armouring and/or an external protection.

These requirements shall ensure that the construction of a CMFSG hose assembly which, when properly installed and correctly used, under normal chemical, mechanical and thermal conditions will provide long term safe operation without degradation.



SECTION : A-A

All dimensions in millimetres

Fig. 1 Spherical Stem

4.2 Material

The CMFSG hose assembly shall be manufactured from materials which shall withstand performance and test requirements given in **4.12.2**. The corrugated metal hose shall be manufactured from mates no less durable and robust than stabilized austenitic stainless steel and conforming to IS 6911. The outer wire braid shall be manufactured from bright annealed austenitic stainless steel wire conforming to IS 6528. End fittings and non-permanently attached parts, whether surface finished or not, shall be manufactured from stainless steel conforming to IS 6911 or from free cutting brass conforming to grade 1 of IS 319.

Where there may be risk of stress corrosion cracking, any threaded parts manufactured from the above brass material shall be stress relieved.

4.3 Requirements for the connection between Hoses and Fittings

The connection between the corrugated hose and the end fitting of a CMFSG hose assembly as defined by this specification shall be made by suitable welding, resulting in an integrated non-detachable connection, which can only be detached by irreparably damaging the hose or the end fitting. The connection shall ensure leak-tightness and shall withstand all tests requested in **4.12.2**.

4.4 End Fittings Design Requirements

End fittings shall comply with the performance requirements of this specification for a reasonable economic and safe working life when tested according to **4.12.2**.

All brass parts shall pass the mercuries nitrate test (season cracking test) when tested according to the method specified in IS 2305.

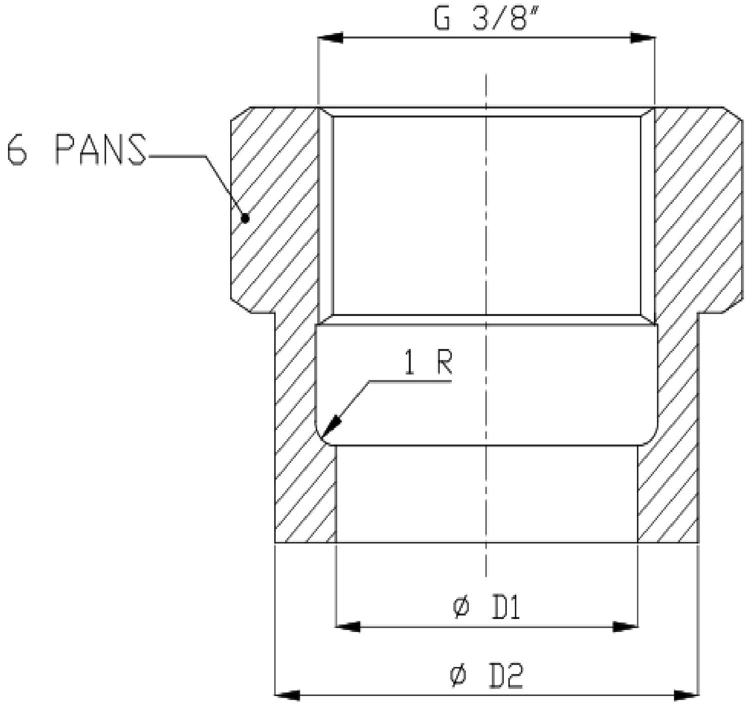
A CMFSG hose assembly shall be fitted either with a swivel nut (*see* Fig. 2) on both ends and or a swivel joint. The design of swivel nuts shall ensure that when used in conjunction with its seal/gasket and its matching part tightness is achieved at a maximum torque of (10 ± 0.5) N-m and that when further tightened to a torque of (50 ± 2.5) N-m without seal/gasket as described in Annex K, there shall be no visible deformation or cracking and the connection shall remain gas right.

Fittings used in conjunction with swivel nuts shall incorporate a means to hold the fitting during the tightening of the swivel nut without applying torsion to the hose or damage to the fitting.

Screwed gas inlet and outlet connections shall have threads specified in **17.3** of IS 5116.

Where threads are used at both ends of an assembly and there is a possibility of the assembly being installed the wrong way round, the fittings shall be identified by different colours and the flow direction shall be marked by the use of an arrow.

Seals/gaskets shall be from material suitable for their intended application. They shall be designed to be reusable and shall be retained on the fitting or held in place by caps and shall comply with IS 11149.



NOTE — Dimensions not given in the above figures shall be arrived suitably by the manufacturer.

All dimensions in millimetres

FIG. 2 BRASS NUT (F)

Screwed connections shall be capable of being assembled and disassembled only by using an appropriate tool without visible damage to the fitting.

NOTE — CMFSG hose assemblies according to this Specification are not designed to be joined together to form a longer length.

4.5 Corrosion Requirements

CMFSG hose assemblies shall be resistant to any corrosive agents reasonably foreseen in a domestic environment.

NOTE — If required the corrosion resistance of a CMFSG hose assembly can be increased by some form of external protection.

4.6 Electric Continuity Requirements

CMFSG hose assemblies shall be electrically continuous along their length. The flexible hoses should have electrical continuity shall not exceed 0.75Ω/m. Test method described in Annex B.

4.7 Insulation Requirements

The corrugated metal hose part of a CMFSG hose assembly shall be electrically insulated externally by the use of an appropriate synthetic material at potential points of contact with metallic elements where cathodic corrosion can take place.

4.8 Insulation Materials

If the materials of a synthetic cover contain corrosive agents as ingredients, such as sulphur or chlorine, care shall be taken to ensure that such agents are not released during the manufacturing process.

4.9 Hygiene

CMFSG hose assemblies shall have an outer environmental protection surface, which can be readily cleaned by normal household cleaning agents.

4.10 Dangerous Substances

Materials used in CMFSG hose assemblies shall not release any dangerous substances in excess of the maximum permitted levels specified in a relevant Standard for the material or permitted in the national regulations.

4.11 Dimensions and Tolerances

4.11.1 *Nominal Size*

The nominal size of the CMFSG hose assemblies are as follows.

Item Code	*Nominal Size*
CMFSG – Model 1	10 mm (3/8”)

4.11.2 *CMFSG Hose Assembly Lengths and Installation*

The nominal lengths of the CMFSG hose assemblies are 1.20 m, 1.50 m and 2.00 m for all CMFSG hose assemblies. The admissible length tolerance is +/– 20 mm. Other lengths of the CMFSG hose assemblies as agreed between the purchaser and the manufacturer.

The CMFSG hose assembly shall not pass through doors, windows, walls, ceilings or floors. It shall be accessible for inspection without disturbing the structure.

The flexible hose shall not be twisted, looped or kinked. It should not be subject to any external pressure.

4.12 Performance Requirements

4.12.1 *General*

If any sample fails one of the tests within the test sequence schedule given in Table 1 then all samples shall be deemed to have failed to meet the type test requirements of this specification. The tests are performed under ambient conditions. If not otherwise indicated the following tolerances shall apply.

Atmospheric pressure	760 mm Hg (1.013 bar)
Relative humidity	65 percent ± 5 percent
Temperature	27 °C ± 2 °C

4.12.2 *Initial Type Test Sequence for CMFSG Hose Assemblies*

For each nominal diameter, nine CMFSG hose assemblies, of 1.0 m length, two of 1.20 m length, four of 0.50 m length shall be tested.

4.12.2.1 *Leak tightness test*

The CMFSG hose assembly shall be leak-tight when tested in accordance with the method given in Annex C.

In the initial leak-tightness test any external protection shall remain in place. In the final leak-tightness test it shall be demonstrated that any external protection does not contribute to the achievement of the given leakage rate.

The verification of gas leak-tightness after installation of the CMFSG hose assembly and its connecting parts shall be in accordance with the manufacturer’s installation instructions.

4.12.2.2 *Structural strength/hydrostatic test*

The CMFSG hose assembly shall be tested in accordance with the method given in Annex D.

A CMFSG hose assembly shall have a structural strength capable of resisting any environmental mechanical influence reasonably foreseen. This shall be regarded as being equivalent to withstanding an internal pressure of 1.0 MPa.

4.12.2.3 *Traction test*

The CMFSG hose assembly shall be tested in accordance with the method given in Annex E.

CMFSG hose assembly shall withstand an axial tension of 1 000 N without leakage. When under this load the assembly length shall not increase by more than 10 percent. After the release of the load the permanent elongation shall not exceed more than 3 percent of the original length and the assembly shall meet the requirements of **4.12.2.1**.

4.12.2.4 *Durability of marking*

The marking on the CMFSG hose assembly shall be permanent and withstand normal usage and wear. If not mechanically impressed or etched in the metal parts belonging to the structure of the CMFSG hose assembly, it shall withstand the test procedure as described in Annex F.

4.12.2.5 *Working temperature*

CMFSG hose assembly shall be designed and constructed so it can safely operate in the ambient temperatures experienced inside and outside of a dwelling. The test procedure is described in Annex G.

4.12.2.6 *Corrosion resistance*

Following the corrosion tests given in Annex H, the CMFSG hose assembly shall show no visual sign of corrosion or other deterioration, which may reasonably be expected to influence the safe performance of the product.

Covers if fitted shall be liquid tight in order to prevent penetration of liquid under the cover and onto the corrugated hose.

4.12.2.6.1 *Salt spray test*

The CMFSG hose assembly shall be tested in accordance with Annex H and the procedure given in Annex H-1.

4.12.2.6.2 *Hydrochloric acid test*

The CMFSG hose assembly shall be tested in accordance with Annex H and the procedure given in Annex H-2.

4.12.2.6.3 *Household cleaning agent test*

The CMFSG hose assembly shall be tested in accordance with Annex H and the procedure given in Annex H-3.

4.12.2.7 *Bending test*

The CMFSG hose assembly shall be tested in accordance with the method given in Annex J.

The CMFSG hose assembly shall be capable of resisting repeated bending to a small radius, such as may be experienced during installation, without leakage or deterioration.

4.12.2.8 *Torsion resistance*

The CMFSG hose assembly shall be tested in accordance with the method given in Annex K.

A CMFSG hose assembly shall be capable of withstanding the torsion that may occur during installation or handling in service.

4.12.2.9 *Impact/crushing resistance*

The CMFSG hose assembly shall be tested in accordance with the method given in Annex L.

CMFSG hose assembly shall be capable of withstanding an impact without significant loss of the performance characteristic of the CMFSG hose assembly.

4.12.2.10 *Drop test (end fittings)*

After testing in accordance with Annex M, end fittings shall be leak-tight when connected to their mating parts. For the leak-tightness test to the connecting parts, dummy fittings may be used.

4.12.2.11 *Torque test (End fittings bodies manufactured from more than one part)*

The CMFSG hose assembly shall be tested in accordance with the method given in Annex N.

Where an end fitting is manufactured from two or more components, these components shall be connected integrally, be non-detachable and shall meet the requirements of the torque test.

4.12.3 *Batch Release Test Sequence for CMFSG Hose Assemblies*

For each nominal diameter, one CMFSG hose assembly shall be tested according to Table 2.

4.12.4 *Production Test for CMFSG Hose Assemblies*

For each nominal diameter of CMFSG hose assemblies 100 percent leak tightness shall be tested as per **4.12.2.1**.

4.12.5 *Water Absorption Test for Gasket*

The gasket shall not absorb more than 10 percent water by weight, when tested as described in Annex P.

5 PACKING AND MARKING

5.1 Packing

The hose shall be packed as agreed to between the purchaser and the supplier.

5.2 Marking

Each length of the hose shall be clearly and durably marked at the intervals of not more than 0.5 m with the following information:

a) Manufacture`s name or trademark, if any;
b) Maximum working pressure: 1.0 MPa;
c) Nominal size;
d) Batch/Lot No;
e) Month and year of manufacture; and
f) IS_______; and
g) Recommended to replace before (MONTH/YEAR).

5.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

Table 1 Initial Type Test Sequence for CMFSG Hose Assemblies

(*Clause* 4.12.1)

SI. No.	Clause No.	1	2	3	4	5	6	7	8	9	10 to 13	14	15	No. of samples
Hose length in (Mtrs)		**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**0.5 + 1.2**	**0.5**	**0.5**	
Leak-tightness test	4.12.2.1	X	X	X	X	X	X	X	X	X	X	X	X	15
Structural Strength 1 Hydrostatic Test	4.12.2.2		X											1
Traction test	4.12.2.3											X		1
Durability of marking test	4.12.2.4	X												1
Working temperature test	4.12.2.5	X	X											2
Salt spray test	4.12.2.6.1	X												1
Hydrochloric acid test	4.12.2.6.2	X												1
Household cleaning agent Test	4.12.2.6.3		X											1
Bending test	4.12.2.7			X	X	X								3
Torsion resistance test	4.12.2.8						X							1
Impact/crushing resistance test	4.12.2.9						X							1
Drop test	4.12.2.10		X											1
Torque test	4.12.2.11		X											1
Final leak-tightness test	4.12.2.1	X	X	X	X	X	X	X	X	X		X		10

Table 2 Batch Release Test Sequence for CMFSG Hose Assemblies

(*Clause* 4.12.3)

Type Test	Clause No.	Number of Samples	Frequency of Test
Leak-tightness test	4.12.2.1	1	Each piece produced
Structural strength/hydrostatic test	4.12.2.2	1	Each piece produced
Durability of marking test	4.12.2.4	1	Each piece produced
Bending test	4.12.2.7	1	Each piece produced
Final leak-tightness test	4.12.2.1	1	Each piece produced

ANNEX A

(*Clause* 3.10)

BURST PRESSURE TEST

A-1 PROCEDURE

The test sample of 500 mm long shall be closed by appropriate fittings and fixed at one end, lying horizontally on a surface. It shall be hydraulically pressurized to 1.5 times its allowable pressure and such pressure held for 1 min. The pressure shall then be increased gradually with a minimum of 10 increments to four times its maximum allowable pressure and the pressure held at this level for 1 min. At this pressure level, the assembly shall not fall by visible leakage or rupture of any of the components. Deformation of the corrugations shall not be regarded as a failure of the test.

NOTE — The pressure can be increased further until the burst occurs. This pressure can be recorded.

ANNEX B

(*Clause* 4.6)

ELECTRICAL CONTINUITY TEST

B-1 PROCEDURE

Take a hose for 1 m long and ensure the hose in cleaned, drained and dry. Place the hose on a flat dry non-conductive surface. Ensure the ohmmeter is calibrated. Select the ohm setting on the meter and ensure to set unit to ohms. Place the 2 contact wires of the meter to the hose ends.

Hold the meter contacts firmly on each end and read the meter. If the meter reads below 0.75 ohm/m, the hose passes the test.

ANNEX C

(*Clause* 4.12.2.1)

LEAK TIGHTNESS TEST

C-1 PROCEDURE

When the final CMFSG hose assembly filled with air/nitrogen at a pressure of 17 Kg/cm^2 (17 bar) is held for 2 min underwater, there shall be no visible bubbles in the entire assembly.

In the final leak-tightness test for type testing it shall be verified that any external protection has not contributed to the achievement of the leak tightness by cutting open the external cover with at least 3 cuts of 40 mm equally spaced along the length of the hose.

ANNEX D

(*Clause* 4.12.2.2)

STRUCTURAL STRENGTH TEST

D-1 PROCEDURE

The length of the CMFSG hose assembly shall be measured on a flat surface and recorded. The CMFSG hose assembly, one of its ends being free to move, shall be gradually pressurized up to 6 Kg/cm^2 (6 bar). This pressure shall be maintained for at least 5 min.

The permeant elongation of the CMFSG hose assembly after release of pressure shall not exceed 3 percent of its length before pressurization. With the exception of the permanent elongation, no visual deformation of the corrugated hose or any other part of the assembly shall be permitted.

Following the test the CMFSG hose assembly shall be subjected to the leak-tightness test given in **4.12.2.1**.

ANNEX E

(*Clause* 4.12.2.3)

TRACTION TEST

E-1 PROCEDURE

The CMFSG hose assembly, including its cover if fitted, shall be attached at one end by its end fitting to a fixed support. The other end shall be fixed to a movable part, moves in the axis of the hose assembly. The CMFSG hose assembly shall be put under tension until the value of 1 000 N is reached. The test rig shall have a feed rate of (100 +/– 5) mm/min. The tension value of 1 000 N shall be maintained for 5 min.

CMFSG hose assemblies incorporating quick connection fittings, if any, shall be attached with the quick connection at the fixed support of the test fixture. Such attachment shall be of the same kind as used in service and the quick connection valve shall be in its open position.

During the test the CMFSG hose assembly length shall not increase more than 10 percent.

After the test upon visual examination there shall be no deterioration, the permanent elongation shall not exceed 3 percent and the CMFSG hose assembly shall pass the leak-tightness test given in **4.12.2.1**.

ANNEX F

(*Clause* 4.12.2.4)

DURABILITY OF MARKING

F-1 PROCEDURE

A piece of cotton cloth is fixed to the end of a 16 mm diameter cylindrical slide in such a way that it can be slid over the marking under a vertical load of 9 (+ 1, –0) N.

The cotton cloth is slid 10 times back and forth over a length of 100 mm of the marking on the CMFSG hose assembly, resulting in a total of 20 friction movements.

The test shall be first performed with a dry cotton cloth and followed with a cotton cloth wetted with de-mineralized water and for both tests it shall be performed on the same place, resulting in a total of 40 friction movements.

Following the above procedure each and every character shall be readable.

ANNEX G

(*Clause* 4.12.2.5)

WORKING TEMPERATURE TEST

G-1 PROCEDURE

A CMFSG hose assembly complete with its cover if fitted shall be placed in an oven at 120 °C ± 2 °C for 72 h. The assembly shall then be removed, allowed to cool to room temperature, and subjected to a visual examination. There shall be no visible cracking or deterioration other than a change of colour of the cover and plastic parts.

A CMFSG hose (PVC cover removed condition) is conditioned at −40 °C ± 2 °C for 5 h and then bent at 180° around a mandrel with a diameter of 120 mm ± 2 mm no cracks or breaks shall be shown. This is the mandatory requirement if the inner liner of CMFSG hose is made from other than stainless steel material.

ANNEX H

(*Clauses* 4.12.2.6, 4.12.2.6.1, 4.12.2.6.2 *and* 4.12.2.6.3)

CORROSION RESISTANCE SALT SPRAY TEST

H-1 PROCEDURE

A CMFSG hose assembly of 1 m length, complete with its cover if fitted shall be placed in a salt spray test chamber. The CMFSG hose assembly is not under pressure. Caps shall close the CMFSG hose assembly. The test chamber shall spray a saline solution having a mass concentration of 5 percent (± 0.5 percent) sodium chloride in distilled water. The intensity of the spray shall be such that, for each 80 cm^2 of the horizontal collecting surface, 2 ml (± 1 ml) of solution are collected per hour. The test chamber shall be maintained at a temperature of 35 °C (± 1 °C). The test shall last 96 h (± 2 h).

This test shall immediately be followed by the test given in Annex H-2. The test result shall be analyzed after both tests are performed.

H-2 HYDROCHLORIC ACID TEST

H-2.1 Procedure

A CMFSG hose assembly of 1 m length, complete with any external cover if fitted, shall be plugged, bent to 180° and placed in a glass vessel of at least 100 mm diameter and 200 mm height, 100 ml of hydrochloric acid of 4 percent concentration at room temperature is slowly rinsed onto the sealing area between the cover and the fitting. This test shall be repeated on both sides of the hose.

The vessel shall then be filled with a further quantity of acid of the same concentration to a depth of between 100 mm and 110 mm. The CMFSG hose assembly is submerged for at least 90 mm into the acid without touching the bottom of the vessel.

During the test, the CMFSG hose assembly shall be held in position by a support. The duration of the test shall be 72 h after which the test sample is rinsed under flowing water.

The CMFSG hose assembly with any external cover removed shall upon visual inspection show no sign of corrosion, penetration or other deterioration, which may reasonably be expected to influence the safe performance of the product and shall remain leak-tight when subjected to the test given in **4.12.2.1**.

H-3 HOUSEHOLD CLEANING AGENT TEST

H-3.1 Procedure

A similar test to that given in Annex H-3 shall be performed but using sodium hypochlorite acid at a concentration of 9 percent.

NOTE — Sodium hypochlorite acid at 9 % concentration is an ingredient of “Javel water” household cleaning agent.

ANNEX J

(*Clause* 4.12.2.7)

BENDING TEST

J-1 PROCEDURE

A CMFSG hose assembly of 1m nominal length, complete with its cover if fitted shall be tested using the test rig shown in Fig. 3. Appropriate values of *a*, *b* and α shall be chosen from Table 3 corresponding to the nearest value of the external diameter of the test sample.

The hose shall be bent around freely rotating mandrels of 30 mm diameter. The stationary end of the hose shall be loaded with a mass of 20 kg.

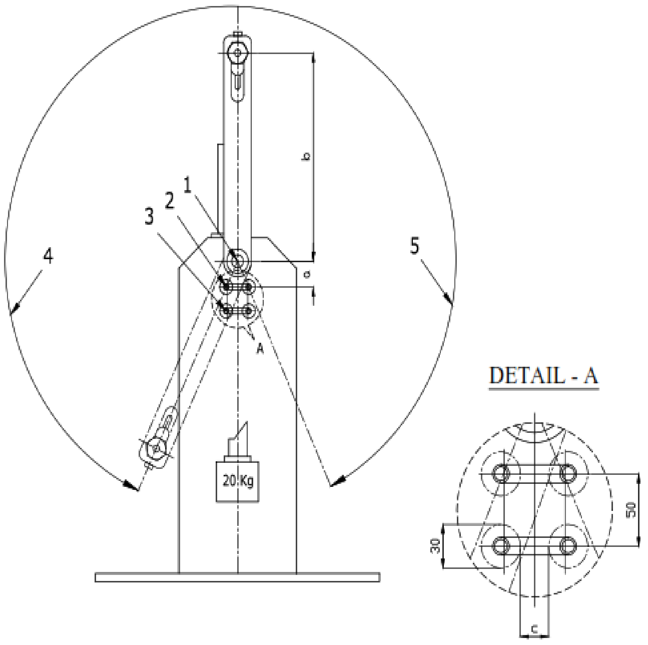
A minimum number of 3 assemblies shall be tested. Each sample shall be subjected to 50 cycles, one cycle being from the neutral position to + α, back through the neutral position to – α and ending at the neutral position. The test shall be carried out at a rate of (10 +/– 1) cycles per minute.

After the test, the sample shall pass the requirements of **4.12.2.1**.

Table 3 Bending Test

(*Clause* J-1)

Hose diameter	10 mm to 17 mm	18 mm to 25 mm
Dimension a	35 mm	40 mm
Dimension b	765 mm	760 mm
Rotation angle α	175°	175°
Hose diameter: External hose diameter at the location of bend including its cover if fitted. Dimension a: Distance from centerline of bending mandrels to centre of pivot point. Dimension b: Length of rotation arm measured from centre of pivot point to the sealing surface of the end fitting of the CMFSG hose assembly. Rotation angle α: Angle between vertical metal hose axis and end position of rotating arm measured at the pivot point.		



KEY

1 Pivot Point at Bending Axis
2 Upper Supporting Mandrel
3 Lower Supporting Mandrel
4 Rotating Angle + α
5 Rotating Angle – α

C = Hose Outside Dia. $^{+0.5}_{+0.2}$ Including Its Cover if Fitted

All dimensions in millimetres

FIG. 3 BENDING TEST

ANNEX K

(*Clauses* 4.4, 4.12.2.8)

TORSION RESISTANCE TEST

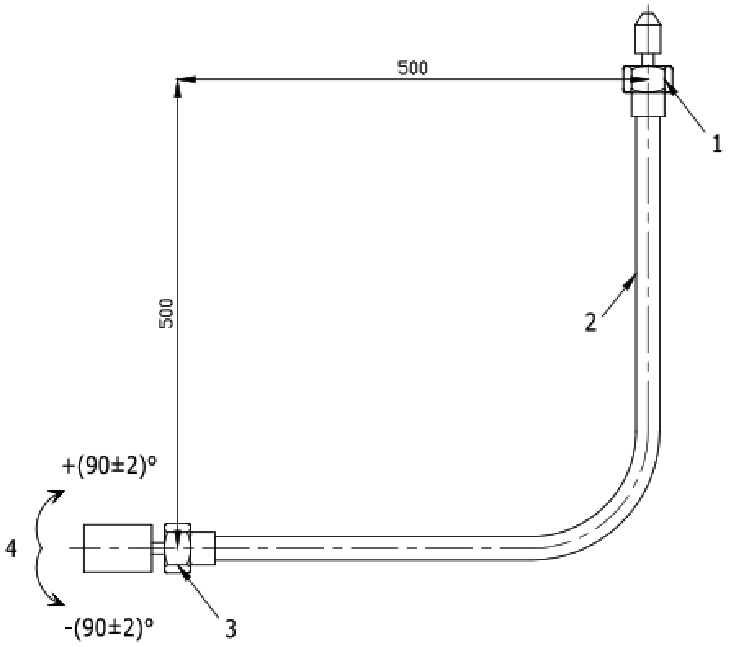
K-1 PROCEDURE

One end of a CMFSG hose assembly of 1 m nominal length, complete with its cover if fitted is fixed in a vertical position. The other end shall be attached horizontally, forming a 90° bend to a device allowing a rotational sinusoidal movement of ± 90° about the rotating axis as shown in Fig. 4. The ends of the CMFSG hose assembly shall have a horizontal and vertical distance of 500 mm from a centre point.

The test sample shall be subjected to 10 000 cycles at a rate of (30 ± 2) cycles per minute.

One cycle shall be defined as the free end of the hose assembly being rotated from the neutral position to + 90 °C, back through the neutral position to – 90° and ending at the neutral position. After the test, the sample shall pass the requirements of **4.12.2.1**.

If swivel joints or quick connect devices are used, they shall be locked to prevent rotation during the test.



KEY

1	Fixed end	3	End Attached to Rotating Device
2	CMG Hose Assembly	4	Rotating Axis

All dimensions in millimetres

FIG. 4 TORSION RESISTANCE TEST

ANNEX L

(*Clause* 4.12.2.9)

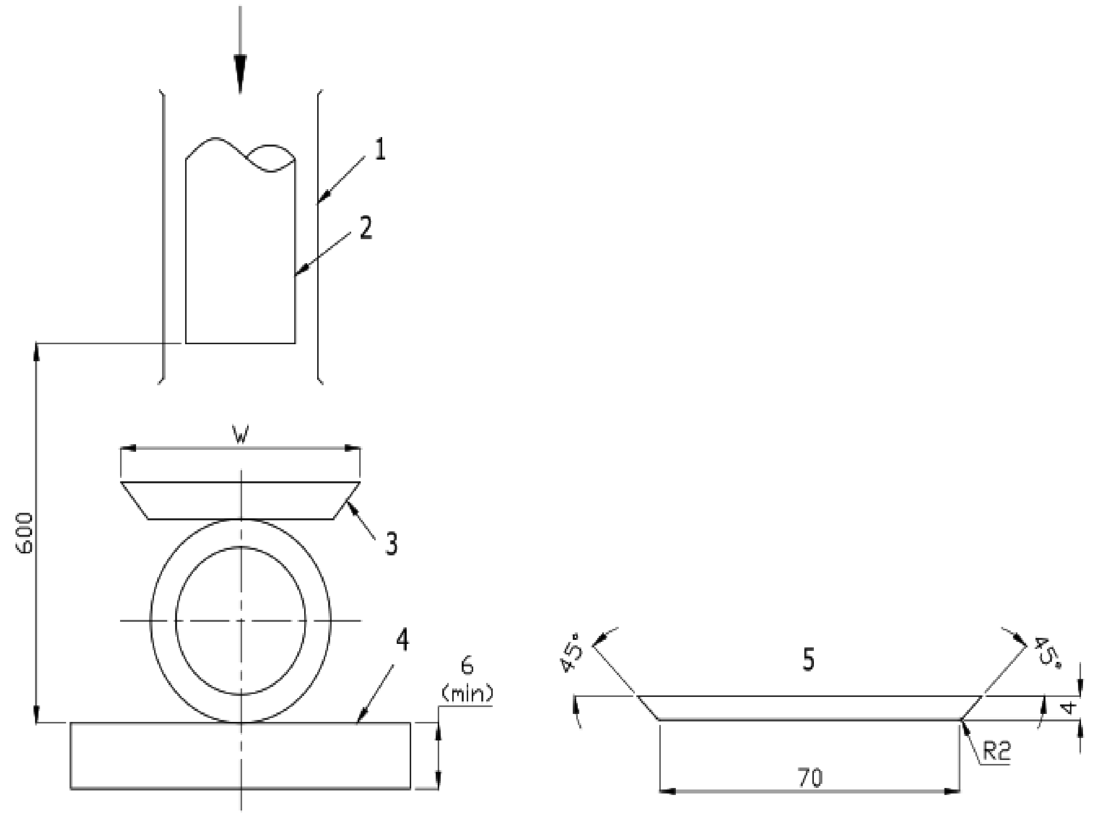
IMPACT/CRUSHING RESISTANCE TEST

L-1 PROCEDURE

The CMFSG hose assembly including any external cover shall be placed in a test apparatus as shown in Fig. 5. The test apparatus shall be placed on a working bench.

A mass of 5 kg is dropped on the hose in free fall from a height of 600 mm.

After the test the CMFSG assembly shall fulfill the requirements of **4.12.2.1**.



KEY

1	Guiding Shell
2	Mass of 5 kgs
3	Mobile Steel Plate of 70 mm Length
4	Supporting Steel Surface
5	Mobile Plate

W = External Diameter of CNG Hose Assembly + 20 mm Approximately

All dimensions in millimetres

FIG. 5 IMPACT/CRUSHING RESISTANCE TEST

ANNEX M

(*Clause* 4.12.2.10)

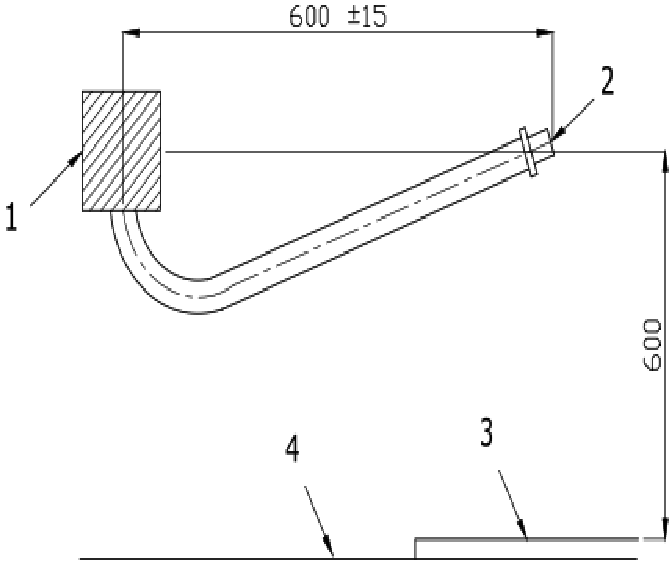
END FITTINGS DROP TEST

M-1 PROCEDURE

A CMFSG hose assembly of 1 m length shall be mounted in a test arrangement as shown in Fig. 6.

The end fitting shall be released and allowed to strike the steel plate a total of 25 times.

After the test the end fitting shall not show any sign of deformation or damage, which may reasonably be expected to impair its performance and when connected to a mating part it shall pass a leak-tightness test according to **4.12.2.1**.



KEY

1	Suitable Rigid Support	3	6 mm Thick 300 mm Square Steel Plate
2	End Fitting	4	Floor

All dimensions in millimetres

FIG. 6 END FITTINGS DROP TEST

ANNEX N

(*Clause* 4.12.2.11)

END FITTINGS BODIES MANUFACTURED MORE THAN ONE PART TORQUE TEST

N-1 PROCEDURE

A torque of 50 N m shall be gradually applied between the components and held for 1 min. If the design has an integrated threaded part, the torsion shall be applied in the direction of loosening the thread.

The components shall not come apart or be damaged. Following the test the fitting shall pass the requirements of **4.12.2.1**.

ANNEX P

(*Clause* 4.12.5)

WATER ABSORPTION TEST

P-1 PROCEDURE

From the finished gasket, cut a piece of about 3 g and weigh it accurately, put in 150 ml of distilled water. Boil under reflux with air condenser for 168 h. Remove the piece and weigh again after surface water layer is dried up with a filter paper.

P-2 CALCULATION

Water absorption, percent by mass = $W_2 – W_1/W_1 \times 100$

where

W_1 = original mass in grams, of test piece before immersion in water; and

W_2 = mass in grams, of the test piece after immersion in water.

ANNEX Q

(*Foreword*)

COMMITTEE COMPOSITION

Composition of Domestic and Commercial Gas Burning Appliances (Pressure Type) Sectional Committee, MED 23

Organization	*Representative(s)*
L P G Equipment Research Centre, Bengaluru	Shri Ashish Bera (***Chairman***)
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This Indian Standard has been developed from Doc No.: MED 23 (17321).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi